UNIVERSITI SAINS MALAYSIA

First Semester Examination
2011/2012 Academic Session

January 2012

CPT111 – Principles of Programming

[Prinsip Pengaturcaraan]

Duration : 2 hours
[Masa : 2 jam]

INSTRUCTIONS TO CANDIDATE:
[ARAHAN KEPADA CALON:]

- Please ensure that this examination paper contains **THREE** questions in **FIFTEEN** printed pages before you begin the examination.

  *[Sila pastikan bahawa kertas peperiksaan ini mengandungi **TIGA** soalan di dalam **LIMA BELAS** muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]*

- Answer **ALL** questions.

  *[Jawab **SEMUA** soalan.]*

- You may answer the questions either in English or in Bahasa Malaysia.

  [Anda dibenarkan menjawab soalan sama ada dalam bahasa Inggeris atau bahasa Malaysia.]

- In the event of any discrepancies, the English version shall be used.

  [Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi bahasa Inggeris hendaklah diguna pakai.]

1. (a) Write the following arithmetic expression in C++:

$$\frac{4}{3(r+34)} - 9(a + bc)^4 + \frac{3 + d(2 + a)}{\sqrt{a + bd}}$$

(8/100)

(b) Write **four (4)** different but equivalent C++ statements to minus 1 from a variable **`Num.`**

(8/100)

(c) Assume that **`int a = 1`** and **`double d = 1.0`**, and that each expression is independent. What are the results of the following expressions?

(i) `a = 5 + 5 * 2 % a--;`

(4/100)

(ii) `a = 4 + 1 + 4 * 5 % (++a + 1);`

(4/100)

(iii) `d += 1.5 * 3 + (++d);`

(4/100)

(iv) `d -= 1.5 * 3 + d++;`

(4/100)

(d) What is wrong in the following code? Rewrite the code correctly using a `switch` statement in C++.

```
if (score >= 60.0)
   grade = 'D';
else if (score >= 70.0)
   grade = 'C';
else if (score >= 80.0)
   grade = 'B';
else if (score >= 90.0)
   grade = 'A';
else
   grade = 'F';
```

(28/100)

(e) Write in two different but equivalent ways for the algorithm below using the following C++ keywords:

(i) `if-else`

(20/100)

(ii) `switch`

(20/100)

Algorithm:

```
if value  of grade is
A, add 10 to sum
B, add 7 to sum
C, add 5 to sum
D, add 3 to sum
F, print student is on probation
all other value print an error "invalid grade" message
```

2. (a) Briefly explain the differences between the following terms:

(i) `break` and `continue` statements.

(10/100)

(ii) `while` loop, `do while` loop and `for` loop.

(10/100)

(b) Write a program that reads in an integer value for n and then sums the integers from n to `2*n` if n is non-negative, or from `2*n` to n if n is negative.

(i) Write the code using only `for` loop.

(10/100)

(ii) Write the code using only `while` loop.

(10/100)

(c) Explain what will happen when the following code runs:

(i)
```
int i=2;
while (i<6);
{
   cout<<”Some even numbers: ”<<i<<i+2<<i+4<<endl;
   ++i;
}
```

(10/100)

(ii)
```
int i;
do
{
   cout<<"\nWould you like to go again? 1 = yes 0 = no";
   cin>>i;
}while(i=1);
```

(10/100)

(d) What is the output of the following program?

```
#include <iostream>
#include <fstream>
using namespace std;

int main ()
{
   const int n = 5;
   for (int i=0;i<=2*n;i++)
   {
      for (int j=0;j<=2*n;j++)
         if(i<=n)
            if (j<n-i||j>n+i)
               cout<<" ";
            else
               cout<<"*";
         else
            if (j<i-n||j>3*n-i)
               cout<<" ";
            else
               cout<<"*";
      cout<<"\n";
   }
   return 0;
}
```

(20/100)

(e) Write a program that writes the multiplication table for integers from 1 to 12 into a text file called "multiplication.txt".

(20/100)

3. (a) Show the output of the following code:

```
#include <iostream>
using namespace std;

void xFunction(int i)
{
   int num = 1;

   for (int j = 1; j <= i; j++) {
      cout << num << " ";
      num *= 3;
   }

   cout << endl;
}

int main()
{
   int i = 1;
   while (i <= 5)
   {
      xFunction(i);
      i++;
   }

   return 0;
}
```

(20/100)

(b) Write a function to compute the following series:

$$m(i) = \frac{1}{2} + \frac{2}{3} + ... + \frac{i}{i+1}$$

Write a test program that displays the following table:

i	**m(i)**
1	0.5
2	1.1667
...	
19	16.4023
20	17.3546

(20/100)

(c) Show the output of the following code:

```
#include <iostream>
using namespace std;

void swap(int n1, int n2)
{
   int temp = n1;
   n1 = n2;
   n2 = temp;
}

int main()
{
   int a[] = {1, 2};
   swap(a[0], a[1]);
   cout << "a[0] = " << a[0] << " a[1] = " << a[1] << endl;

return 0;
}
```

(20/100)

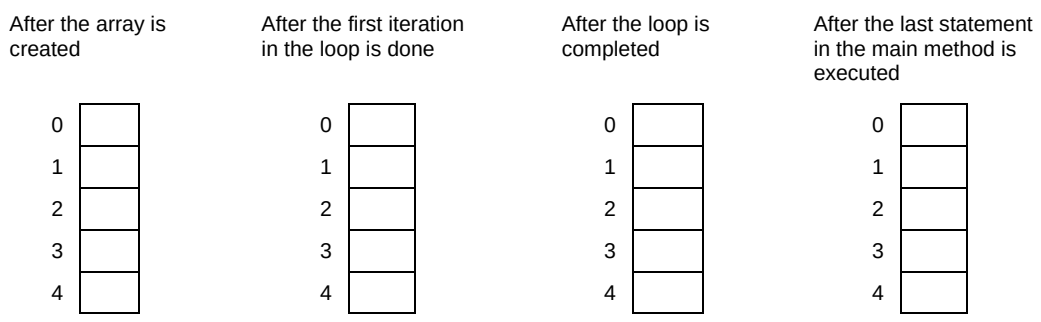
(d) Given the following program, fill in the values of the array in the following figure:

```
#include <iostream>
using namespace std;

int main()
{
   int values[5];
   for (int i = 1; i < 5; i++)
   {
      values[i] = i;
   }

   values[0] = values[1] + values[4];

   return 0;
}
```



(20/100)

(e) (i) What is the output of the following code?

```
#include <iostream>
using namespace std;

void f1(int x, int &y, int *z)
{
   x++;
   y++;
   (*z)++;
}

int main()
{
   int i = 1, j = 1, k = 1;
   f1(i, j, &k);

   cout << "i is " << i << endl;
   cout << "j is " << j << endl;
   cout << "k is " << k << endl;

   return 0;
}
```

(10/100)

(ii) What is the output of the following code?

```
#include <iostream>
#include <fstream>
using namespace std;

int main()
{
   ofstream output;

   // Create a file
   output.open("scores.txt");

   // Write two lines
   output << "John" << " " << "T" << " " << "Smith"
      << " " << 90 << endl;
   output << "Eric" << " " << "K" << " " << "Jones"
      << " " << 85;

   output.close();

   ifstream input;

   // Open a file
   input.open("scores.txt");

   // Read data
   char firstName[80];
   char mi;
   char lastName[80];
   int score;
   input >> firstName >> mi >> lastName >> score;
   double sum = score;

   input >> firstName >> mi >> lastName >> score;
   sum += score;

   cout << "Total score is " << sum << endl;

   input.close();

   return 0;
}
```

(10/100)

1. (a) Tulis kenyataan aritmetik berikut dalam C++:

$$\frac{4}{3(r+34)} - 9(a + bc)^4 + \frac{3 + d(2 + a)}{\sqrt{a + bd}}$$

(8/100)

(b) Tulis **empat (4)** penyataan C++ yang berlainan tetapi bersamaan untuk menolak 1 daripada pemboleh ubah **`Num`**.

(8/100)

(c) Andaikan yang **`int a = 1`** dan **`double d = 1.0`**, dan juga setiap penyataan adalah kendiri. Apakah hasil bagi penyataan berikut?

(i) `a = 5 + 5 * 2 % a--;`

(4/100)

(ii) `a = 4 + 1 + 4 * 5 % (++a + 1);`

(4/100)

(iii) `d += 1.5 * 3 + (++d);`

(4/100)

(iv) `d -= 1.5 * 3 + d++;`

(4/100)

(d) Apakah kesilapan kod berikut? Tulis semula kod ini dengan betul dengan menggunakan satu penyataan `switch` dalam C++.

```
if (score >= 60.0)
   grade = 'D';
else if (score >= 70.0)
   grade = 'C';
else if (score >= 80.0)
   grade = 'B';
else if (score >= 90.0)
   grade = 'A';
else
   grade = 'F';
```

(28/100)

(e) Tulis dua cara yang berlainan tetapi bersamaan untuk algoritma di bawah dengan menggunakan kata kunci C++ berikut:

(i) `if-else`

(20/100)

(ii) `switch`

(20/100)

Algoritma:

```
if value  of grade is
A, add 10 to sum
B, add 7 to sum
C, add 5 to sum
D, add 3 to sum
F, print student is on probation
all other value print an error "invalid grade" message
```

2. (a) Jelaskan dengan ringkas perbezaan antara penyataan berikut:

(i) kenyataan `break` dan `continue`.

(10/100)

(ii) ulangan `while`, ulangan `do while` dan ulangan `for`.

(10/100)

(b) Tulis satu atur cara yang membaca satu nilai integer untuk n dan kemudian jumlahkan nilai-nilai integer dari n sehingga `2*n` jika n ialah bukan-negatif, atau dari `2*n` sehingga n jika n ialah negatif.

(i) Tulis kod dengan hanya menggunakan ulangan `for`.

(10/100)

(ii) Tulis kod dengan hanya menggunakan ulangan `while`.

(10/100)

(c) Jelaskan apa yang akan berlaku apabila kod berikut dilaksanakan:

(i)
```
int i=2;
while (i<6);
{
   cout<<”Some even numbers: ”<<i<<i+2<<i+4<<endl;
   ++i;
}
```

(10/100)

(ii)
```
int i;
do
{
   cout<<"\nWould you like to go again? 1 = yes 0 = no";
   cin>>i;
}while(i=1);
```

(10/100)

(d) Apakah hasil cetak atur cara berikut?

```
#include <iostream>
#include <fstream>
using namespace std;

int main ()
{
   const int n = 5;
   for (int i=0;i<=2*n;i++)
   {
      for (int j=0;j<=2*n;j++)
         if(i<=n)
            if (j<n-i||j>n+i)
               cout<<" ";
            else
               cout<<"*";
         else
            if (j<i-n||j>3*n-i)
               cout<<" ";
            else
               cout<<"*";
      cout<<"\n";
   }
   return 0;
}
```

(20/100)

(e) Tulis satu atur cara yang akan menulis jadual darab untuk nilai integer dari 1 hingga 12 dalam fail teks yang dipanggil "multiplication.txt".

(20/100)

3. (a) Berikan hasil cetak kod berikut:

```
#include <iostream>
using namespace std;

void xFunction(int i)
{
   int num = 1;

   for (int j = 1; j <= i; j++) {
      cout << num << " ";
      num *= 3;
   }

   cout << endl;
}

int main()
{
   int i = 1;
   while (i <= 5)
   {
      xFunction(i);
      i++;
   }

   return 0;
}
```

(20/100)

(b) Tulis satu fungsi untuk mengira jujukan berikut:

$$m(i) = \frac{1}{2} + \frac{2}{3} + ... + \frac{i}{i+1}$$

Tulis satu atur cara untuk menguji fungsi di atas yang memaparkan jadual di bawah:

i	**m(i)**
1	0.5
2	1.1667
...	
19	16.4023
20	17.3546

(20/100)

(c) Berikan hasil cetak kod berikut:

```
#include <iostream>
using namespace std;

void swap(int n1, int n2)
{
   int temp = n1;
   n1 = n2;
   n2 = temp;
}

int main()
{
   int a[] = {1, 2};
   swap(a[0], a[1]);
   cout << "a[0] = " << a[0] << " a[1] = " << a[1] << endl;

return 0;
}
```

(20/100)

(d) Diberi atur cara berikut, isikan kandungan tatasusunan di dalam rajah berikut:

```
#include <iostream>
using namespace std;

int main()
{
   int values[5];
   for (int i = 1; i < 5; i++)
   {
      values[i] = i;
   }

   values[0] = values[1] + values[4];

   return 0;
}
```

Selepas tatasusun dicipta	Selepas iterasi pertama gelung dilaksanakan	Selepas gelung dilaksanakan sepenuhnya	Selepas penyataan terakhir dalam kaedah `main` dilaksanakan
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4

(20/100)

(e) (i) Apakah output bagi kod berikut?

```
#include <iostream>
using namespace std;

void f1(int x, int &y, int *z)
{
   x++;
   y++;
   (*z)++;
}

int main()
{
   int i = 1, j = 1, k = 1;
   f1(i, j, &k);

   cout << "i is " << i << endl;
   cout << "j is " << j << endl;
   cout << "k is " << k << endl;

   return 0;
}
```

(10/100)

(ii) Apakah output bagi kod berikut?

```
#include <iostream>
#include <fstream>
using namespace std;

int main()
{
   ofstream output;

   // Create a file
   output.open("scores.txt");

   // Write two lines
   output << "John" << " " << "T" << " " << "Smith"
      << " " << 90 << endl;
   output << "Eric" << " " << "K" << " " << "Jones"
      << " " << 85;

   output.close();

   ifstream input;

   // Open a file
   input.open("scores.txt");

   // Read data
   char firstName[80];
   char mi;
   char lastName[80];
   int score;
   input >> firstName >> mi >> lastName >> score;
   double sum = score;

   input >> firstName >> mi >> lastName >> score;
   sum += score;

   cout << "Total score is " << sum << endl;

   input.close();

   return 0;
}
```

(10/100)